Theory to learn for second exam.

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 \mathbf{Two} of the *following questions* will be on the exam:

- 1. Give a formula for the probability of exactly k successes in a series of n independent Bernoulli trials, with probability of success p and prove the formula. (Theorem 2, page 369)
- 2. Define the expected value of a random variable and then show that it is additive and linear. (Definition 1, page 379, and Theorem 3, page 382)
- 3. Show that the expected number of successes in n Bernoulli trials, with probability of success p is np. (Theorem 2, page 381)
- 4. Show that, if the probability that a coin comes up tails is p, then the expected number of flips of that coin until it comes up tails for the first time is $\frac{1}{p}$. (Example 10, page 386)
- 5. Give the definition of the variance V(X) of a random variable X and then show that $V(X) = E(X^2) - E(X)^2$. (Definition 4 and Theorem 6, page 388)
- 6. Show that the variance of two independent random variables is the sum of their variances. Is that necessarily true if the random variables are not independent? Explain. (Theorem 7, page 390)
- 7. State and prove Chebyshev's Inequality. (Theorem 8, page 391)

In addition, **three problems** out of problems 11-18 from your *second home-work set* and problems 1-10 out of your *third homework set* will be chosen to complete the five questions on your exam.